AMENDMENT TO THE CLAIMS:

Please cancel Claims 7-16, without prejudice.

LISTING OF CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. A diagnostic method, comprising:

estimating a temperature of a NOx-reducing catalyst based on a thermodynamic model of said NOx-reducing catalyst;

estimating a hydrocarbon conversion efficiency of said NOx-reducing catalyst based on said temperature estimate; and

estimating a parameter indicative of an age of said NOx-reducing catalyst based on said estimated hydrocarbon conversion efficiency of said catalyst.

2. The method as set forth in Claim 1 wherein said thermodynamic model of said NOx-reducing catalyst is described by the following equations:

$$\frac{d}{dt}\left(c_{substrate} m_{cat} T + c_{gas} m_{gas} T\right) = c_p W (T_{in} - T) + h_t A_{cat} (T_{amb} - T) + \left(W_{HC} \cdot f_{burn}(T) + f_{rel}(T) \cdot HC_{st}\right) \cdot Q_{lh} \quad (1)$$

$$\frac{d}{dt} HC_{st} = (1 - f_{burn}(T)) \cdot W_{HC} - f_{rel}(T) \cdot HC_{st} \quad (2$$

wherein $c_{substrate}$ is a heat capacity of a NOx-reducing catalyst substrate substrate, $m_{cat}$ is a mass of said catalyst, $c_{gas}$ is a heat capacity of the exhaust gas, $m_{gas}$ is a mass of the exhaust gas in the catalyst, $c_p$ is a heat capacity of air at constant pressure, $W$ is a total exhaust flow into said catalyst, $T_{in}$ is a temperature of an exhaust gas mixture entering said NOx-reducing catalyst, $h_t$ is a convective heat transfer coefficient of said

catalyst, $A_{cat}$ is a catalyst area exposed to said exhaust gas mixture entering said catalyst, $T_{amb}$ is an ambient temperature, $W_{HC}$ is a hydrocarbon flow transported in said exhaust gas mixture, $f_{burn}(T)$ is said hydrocarbon conversion efficiency of said catalyst, $Q_{lhv}$ is a heat contained in a unit mass of fuel, $f_{rel}(T)$ is an amount of hydrocarbons released and subsequently oxidized, and $HC_{st}$ is an amount of hydrocarbons stored in the catalyst.

3. The method as set forth in Claim 2 wherein said hydrocarbon conversion efficiency of said NOx-reducing catalyst is estimated by inverting said model in order to obtain an input from an output.

4. The method as set forth in Claim 1 wherein said NOx-reducing catalyst is an ALNC.

5. The method as set forth in Claim 1 wherein said NOx-reducing catalyst is an oxidation catalyst.

6. The method as set forth in Claim 1 further comprising providing an indication of catalyst degradation based on said parameter.

7-16. Cancelled.

17. A diagnostic system, comprising:

an internal combustion engine;

a NOx-reducing catalyst coupled downstream of said engine; and

a computer storage medium having a computer program encoded therein, comprising:

code for estimating a temperature of said NOx-reducing catalyst based on a thermodynamic model of said NOx-reducing catalyst;

code for estimating a hydrocarbon conversion efficiency of said NOx-reducing catalyst based on said temperature estimate; and

code for estimating a parameter indicative of an age of said NOx-reducing catalyst based on said estimated hydrocarbon conversion efficiency of said catalyst.